

Amendments to the Claims

Please amend Claims 1, 4, 5, 13-15, 19-24 and 27 to read as follows.

1. (Currently Amended) A printing apparatus for printing an image on a print medium by using a print head, comprising:

a transport means for transporting the print medium by a driving force of a first drive source;

a feeding means for feeding the print medium to the transport means by a driving force of a second drive source; and

a recovery means for performing, by a first drive mechanism and a second drive mechanism, a recovery operation to maintain a printing performance of the print head[;],

wherein the first drive mechanism uses the first drive source as its drive source and is operated through a clutch mechanism according to a direction in which a driving force of the first drive source is generated, the clutch mechanism being adapted to transmit a rotation in only one direction of the first drive source[;], and

wherein the second drive mechanism uses the second drive source as its drive source, has a dead zone in which a rotational force is not transmitted to the feeding means when the second drive source changes its rotation direction, and is operated in the dead zone according to a direction in which a driving force of the second drive source is generated.

2. (Original) A printing apparatus according to claim 1, wherein the print head is an ink jet print head capable of ejecting ink from nozzles, and

one of the first drive mechanism and the second drive mechanism is a pump mechanism to produce a pressure for discharging ink not contributing to image printing from nozzles of the ink jet print head.

3. (Original) A printing apparatus according to claim 2, wherein the pump mechanism produces a negative pressure to suck out ink not contributing to image printing from nozzles of the ink jet print head.

4. (Currently Amended) A printing apparatus according to claim 2, further comprising:

a discharge means for discharging the print medium transported by the transport means;

wherein the transport means transports the print medium toward the discharge means by a driving force in one direction of the first drive source and transports the print medium from the discharge means toward the feeding means by a driving force in the other direction of the first drive source~~[[;]],~~ and

wherein the pump mechanism is the first drive mechanism and is not driven by a the driving force in one direction of the first drive source and is driven by a the driving force in the other direction of the first drive source.

5. (Currently Amended) A printing apparatus according to claim 2, wherein

the pump mechanism ~~forms~~ comprises a piston pump having a piston adapted to move in a cylinder.

6. (Original) A printing apparatus according to claim 1, wherein the print head is an ink jet print head capable of ejecting ink from nozzles, and

one of the first drive mechanism and the second drive mechanism is at least a capping mechanism for capping the ink jet print head or a wiping mechanism for wiping a nozzle-formed face of the ink jet print head.

7. (Original) A printing apparatus according to claim 1, wherein the second drive mechanism is started when a driving force of the second drive source changes its direction from one direction to the other direction, and the feeding means is not driven while the second drive mechanism is operating, feeds the print medium to the transport means by a driving force in one direction of the second drive source, and returns the print medium from the transport means by a driving force in the other direction of the second drive source.

8. (Original) A printing apparatus according to claim 7, wherein the feeding means has a dead zone in which it is not driven by a driving force of the second drive source from when the second drive mechanism starts until it completes the operation.

9. (Original) A printing apparatus according to claim 7, wherein, when the operation of the second drive mechanism is completed by a driving force in one direction of the second drive source, the second drive mechanism is not driven by a driving force in one direction subsequently produced by the second drive source.

10. (Original) A printing apparatus according to claim 9, further comprising:

a gear train for transmitting a driving force in one direction of the second drive source to the second drive mechanism; and

a notched portion provided at one part of the gear train, the notched portion being adapted to interrupt a transmission of the driving force in one direction of the second drive source to the second drive mechanism when the operation of the second drive mechanism using the driving force in one direction of the second drive source is completed.

11. (Original) A printing apparatus according to claim 1, wherein the feeding means has a dead zone in which it is not driven immediately by a driving force of the second drive source, and the second drive mechanism is driven in the dead zone of the feeding means by driving forces in one direction and the other direction of the second drive source.

12. (Original) A printing apparatus according to claim 1, wherein the second drive mechanism has its operation amount limited based on a result of detection by a position detection means that detects a position of a moving part of the second drive mechanism.

13. (Currently Amended) A recovery device for performing a recovery operation on a print head to maintain a printing performance of the print head, the print head being adapted to print an image on a print medium, the recovery device comprising:

a first drive mechanism and a second drive mechanism for performing the recovery operation[[:]],

wherein the first drive mechanism uses as its drive source a first drive source for driving a transport means to transport the print medium and is operated through a clutch mechanism according to a direction in which a driving force of the first drive source is generated, the clutch mechanism being adapted to transmit a rotation in only one direction of the first drive source[[:]], and

wherein the second drive mechanism uses as its drive source a second drive source for driving a feeding means to feed the print medium to the transport means, has a dead zone in which a rotational force is not transmitted to the feeding means when the second drive source changes its rotation direction, and is operated in the dead zone according to a direction in which a driving force of the second drive source is generated.

14. (Currently Amended) A recovery method for performing a recovery operation on a print head to maintain a printing performance of the print head, the print head being adapted to print an image on a print medium, the recovery method comprising the steps of:

using a first drive mechanism and a second drive mechanism for performing the recovery operation[[:]],

wherein the first drive mechanism uses as its drive source a first drive source for driving a transport means to transport the print medium and is operated through a clutch mechanism according to a direction in which a driving force of the first drive source is generated, the clutch mechanism being adapted to transmit a rotation in only one direction of the first drive source[[:]], and

wherein the second drive mechanism uses as its drive source a second drive source for driving a feeding means to feed the print medium to the transport means, has a dead zone in which a rotational force is not transmitted to the feeding means when the second drive source changes its rotation direction, and is operated in the dead zone according to a direction in which a driving force of the second drive source is generated.

15. (Currently Amended) A piston pump for reciprocally driving a piston in a cylinder through a piston shaft by using a rotating force of a rotating body, wherein the piston shaft is kept from rotating about its own axis,

wherein the rotating body is rotatable about the axis of the piston shaft,
wherein one of facing parts of a circumference of the piston shaft and a
circumference of the rotating body is formed with a continuous spiral groove that crosses at
one part, and

wherein the other of the facing parts is provided with a projection that fits in
the groove so that it is movable relative to the groove, in order to convert a rotary motion in
at least one direction of the rotating body into a linear reciprocal motion of the piston shaft.

16. (Original) A piston pump according to claim 15, wherein
a boat-shaped piece rotatable about an axis almost perpendicular to the axis
of the piston shaft is mounted on the rotating body at a fixed position, and
the projection is provided to the boat-shaped piece.

17. (Original) A piston pump according to claim 15, further comprising:
a rotary driving body; and
a clutch mechanism to transmit a rotating force in one direction of the rotary
driving body to the rotating body.

18. (Original) A piston pump according to claim 17, wherein
the clutch mechanism has a spring which is tightened by the rotation in one
direction of the rotary driving body and transmits the rotating force and which is loosened
by the rotation in the other direction of the rotary driving body and does not transmit the
rotating force.

19. (Currently Amended) A piston pump according to claim 15, further
comprising:

a rotary driving body; and

a transmission mechanism to transmit a rotating force of the rotary driving
body to the rotating body[;],

wherein the transmission mechanism has a dead zone in which the rotating
force of the rotary driving body is not transmitted to the rotating body until the rotary
driving body rotates a predetermined distance after it has changed its rotating direction.

20. (Currently Amended) A printing apparatus for printing an image on
a print medium by using a print head, comprising:

a recovery means for performing a recovery operation to maintain a function
of the print head by using an introduced pressure[;],

wherein the piston pump as claimed in claim 15 is used as a source of the pressure used by the recovery means.

21. (Currently Amended) A printing apparatus according to claim 20, wherein the print head is an ink jet print head capable of ejecting ink from its nozzles[;],

wherein the recovery means has a suction-based recovery function to suck out ink not contributing to image printing from the nozzles of the ink jet print head by using the introduced negative pressure[;], and

wherein the piston pump generates the negative pressure used by the recovery means.

22. (Currently Amended) A printing apparatus according to claim 20, further comprising:

a transport means for transporting the print medium by a rotating force of a transport roller[;],

wherein the piston pump is driven by the rotating force of the transport roller.

23. (Currently Amended) A printing apparatus according to claim 20
22,

wherein the piston shaft of the piston pump is arranged on a rotary axis of
the transport roller.

24. (Currently Amended) A printing apparatus according to claim 22,
wherein the transport roller ~~is a roller to transport~~ transports the print
medium from a printing operation position in a discharge direction.

25. (Original) A printing apparatus according to claim 20,
wherein the print head is an ink jet print head capable of ejecting ink from
its nozzles by using thermal energy generated by electrothermal transducers.

26. (Original) A recovery device for performing a recovery operation to
maintain a function of a print head by using an introduced pressure, the recovery device
having the piston pump as claimed in claim 15 as a source of the pressure used by the
recovery operation.

27. (Currently Amended) A recovery device according to claim 26,
wherein the print head is an ink jet print head capable of ejecting ink from
its nozzles[[:]],
wherein the recovery operation includes a suction-based recovery operation
to suck out ink not contributing to image printing from the nozzles of the ink jet print head
by using the introduced negative pressure[[:]], and
wherein the piston pump generates a negative pressure used by the suction-
based recovery operation.